ASSOCIATING OBSERVATIONS OF THE SUN AND SOLAR WIND

R. Woo (1), and S.R. Habbal (2,3)
(1) Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, (2) University of Wales, Aberysweth, UK
richard.woo@jpl.nasa.gov

Connecting the Sun and the solar wind is fundamental not only for understanding the source and evolution of the solar wind, but also for distinguishing interplanetary generated features from those originating at the Sun. Recent studies have shown that the statistical characteristics (average, standard deviation, autocorrelation function) of density in the fast solar wind observed by Ulysses are organized by latitude in the same manner as those of path-integrated density in the inner corona, suggesting that the Ulysses fast wind observed at a given latitude came from the same latitude at the Sun. In this paper, we map radially back to the Sun the individual daily Ulysses density measurements of the high–latitude (>40°) fast wind observed during 1994–1996, and compare them with the corresponding daily pB (polarized brightness) measurements at 1.15 Ro made by the HAO (High Altitude Observatory) MLSO (Mauna Loa Solar Observatory) Mk III K-coronameter. We show that although there are hints in the Ulysses measurements of the longitudinal coronal structure of polar coronal holes, polar coronal hole structure at the Sun does not generally survive to the distances probed by Ulysses (> 1.5 AU). On the other hand, longitudinal structure in the quiet Sun gives rise to the interaction regions observed by Ulysses at high latitude, the strongest occurring during the south polar passage of Ulysses, when the fast wind from the equatorward extending polar coronal hole (approximately 800 km/s) runs into the slower fast wind from the quiet Sun (approximately 700 km/s) and ahead of it. We also show that the weaker interaction regions observed by Ulysses during its north polar passage in 1995–96 are a consequence of correspondingly smaller longitudinal variations in pB at the Sun.